

Environmental Consultants

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www.scsengineers.com**SCS FIELD SERVICES**May 6, 2004  
File No. 05203029.00SENT VIA FAX 5/6/04  
Fax no. (502) 540-6970Mr. Richard H. Watkins  
Louisville and Jefferson Metropolitan Sewer District  
3050 Commerce Center Place  
Louisville, Kentucky 40211Subject: Lee's Lane Landfill  
Landfill Gas (LFG) Collection System Investigation

Dear Mr. Watkins:

SCS Engineers (SCS) was contracted by the Louisville and Jefferson County Metropolitan Sewer District (District) to perform a maintenance inspection of the LFG collection system. The inspection has two primary objectives:

- Identify the portions of the system that are functioning, the portions that are not, and providing guidance to the District for remediation.
- Perform fieldwork with a District maintenance staff member to show the inspection and system management process that we are carrying out.

**INTRODUCTION**

In about 1980 SCS designed and provided construction oversight of the original system that was installed to control off-site LFG at this former National Priority List site. The system consisted of 31 vertical extraction wells, connecting piping, a blower that free-vents to the atmosphere, and LFG monitoring probes (G1 to G5).

In 1985 and 1986 SCS conducted operation evaluations and recommended remedial actions, which were subsequently carried out by District staff. Limited operation and maintenance (O&M) has been performed on the LFG system since 1986, except for the blower station which is currently maintained by District maintenance staff, and several LFG monitoring probes continue to be monitored by District staff.

**ON-SITE ACTIVITIES**

During our site visit the week of February 2, 2004, SCS Field Services (SCS-FS) had determined that at least two substantial blockages exist in the LFG collection header line at the subject site and that further investigation was warranted. Pressure readings indicated blockages located between moisture traps (MT) 16 and 17 and between MT 23 and 24. Data collected during the site visits are presented in Table 1. The District approved the additional investigation by SCS-FS to install temporary, above-grade jumper-lines bypassing these blockages to permit further investigation concerning the integrity of the LFG collection system.



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On March 24, 2004, SCS-FS visited the site, installed the two temporary jumper-lines, and monitored the vacuum distribution of the LFG collection system. One jumper-line was installed on the north header line and one jumper-line was installed on the south header line. Access to the LFG blower building and the LFG monitoring probes that are located along the site's eastern property boundary was not available on March 24. SCS-FS returned to the site on March 26, 2004, to continue the investigation. Data collected during the site visits is presented in Table 1.

## CONCLUSIONS AND RECOMMENDATIONS

Results of the jumper-line installation on the northern and southern header lines were disappointing, indicating blockages in addition to those identified in February exist. The vacuum-pressure gradient throughout the system was extended, at best, an additional 300 feet with the jumper-lines. Thus, approximately 2/3 of the total system is not being influenced by the blower and the results indicated marginally positive or minimum negative pressures as shown in Table 1.

On the southern header line, the jumper was installed between MT 16 and 17. On March 24, 2004, the jumper-line had a vacuum of -16.6 inches of water column (in-W.C.) at MT 17 and -15.4 in-W.C. at MT 16. Gas extraction well (EW) 16, which is located 70 feet from MT 16 had a vacuum of -0.1 in-W.C.. Moisture trap 15, which is located 100 feet upstream from MT 16, exhibited 0.0 in-W.C. pressure. Thus, the vacuum readings indicated that an additional blockage or breakage exists between MT 15 and 16.

Similar results were obtained with the northern jumper installed over the Lee's Lane access road between MT 23 and 24. The -16.8 in-W.C. vacuum at MT 23 delivered -16.0 in-W.C. negative pressure to the upstream MT 25, -11.2 in-W.C. to EW 25, and 0.0 in-W.C. to MT 26. These vacuum readings indicated that a blockage or breakage also exists between EW 25 and MT 26.

It is highly probable that additional blockage or breakage exists in the upstream portions of the two header manifolds that, without installation of supplemental jumper-lines, cannot be identified. SCS believes it would not be cost effective for the District to invest further time, effort, or expense to investigate these probable locations in a system that is obviously in need of repairs.

The extraction wells, on average, were drilled to depths of approximately 25 feet. Of the system's thirty-one extraction wells, twenty-five could be investigated for liquid levels and/or boring depths. Three EW's, 19, 20 and 29 were covered by standing surface water and could not be sounded for depths. Twelve of the EW's which could be monitored had liquid levels and/or depths between 22 and 25 feet. Seven extraction wells had liquid levels and/or casing depths of 15 to 22 feet. Two EW's exhibited liquid levels between 10 and 15 feet and three EW's had liquid levels from 0 to 10 feet. The water can be a barrier to gas migration and block the perforations in the extraction well pipe. At EW 17, the casing was sheared off at 3.3 feet allowing the casing to spin when attempting to unscrew the 4 inch well cap. Extraction well sounding data is presented in the comments section of Table 1.

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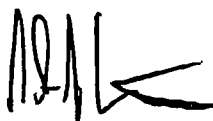
Monitoring data did not indicate methane in four of the five LFG probe locations installed along the eastern property boundary or the adjacent neighborhood. However, probe G1 adjacent to the blacktop access road south of Lee's Lane and Pulman Road exhibited 5.3 to 7.5 percent methane by volume. These concentrations are above the lower explosive limit for methane and merit concern. This location coincides with and is directly adjacent to the blocked southern portion of the LFG collection system which is not currently influenced by the full negative pressure applied to the collection manifold by the blower, see Figure 1 for LFG monitoring probe locations.

Due to the loss of vacuum throughout the majority of the LFG collection system and the concentrations of methane in probe G1, SCS recommends replacement of the collection manifold. The majority of the extraction wells are not currently being influenced by the blower, a phased construction approach followed by system re-evaluation would appear to be the most prudent course of action. This concept would allow determination of the effectiveness of the existing extraction wells once the negative pressure gradient has been re-established throughout the LFG collection system. The existing system is approximately 25 years old, which is at or beyond the typical useful life for a LFG collection system. Pumping out the liquids in the watered-in locations may recover the ability of these EW's to apply the negative pressure gradient to their immediate area, increasing their radius of influence and possibly eliminating the cost associated with installation of replacement wells.

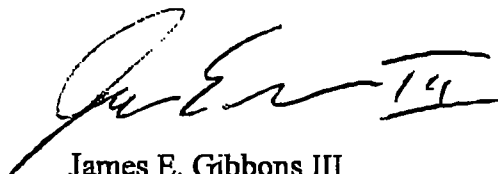
By decreasing the existing 4.0 percent slope of the LFG collection header piping to 1.0 percent and taking advantage of existing grade, the number of traps can be diminished and we estimated 7 in the budgetary construction estimate. The rough budgetary construction estimate with the low and high range was prepared by SCS-FS. This budget estimate does not include engineering and other assumptions which are identified on Exhibit A. The estimated high range cost includes new EW installations. This budgetary construction cost estimate range is \$226,550 (no EW's) to \$327,750 (new EW's), see Exhibit A.

SCS-FS appreciates this opportunity to perform the investigative effort on this challenging project and welcomes any request to explain or clarify this letter report.

Respectfully yours,



FOR Larry D. Thompson  
Project Superintendent  
SCS FIELD SERVICES



James E. Gibbons III  
Project Manager  
SCS FIELD SERVICES

cc: Anthony DiPuccio, P.E. - SCS Engineers

LDT/JEG:jcg

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**TABLE 1. LEE'S LANE LANDFILL  
FEBRUARY AND MARCH 2004 MONITORING RESULTS**

Location	Date	Time	Methane (% vol.)	Carbon Dioxide (% vol.)	Oxygen (% vol.)	Balance Gas (% vol.)	Pressure (in-W.C.)	Flow (scfm)	Temp. (deg. F)	Comments
Blower Inlet	02/03/04	10:15 AM	0.5	6.7	13.5	79.3	-46.7		46	
Blower Outlet	02/03/04	10:36 AM	0.5	6.8	13.8	78.9	0.0		58	
	02/04/04	3:21 PM	1.1	7.3	12.6	79.0	0.0	154	80	
EW 01	02/04/04	10:05 AM	ND	ND	20.4	79.6	-0.6			23.7 ft. to liquid
EW 02	02/04/04	10:44 AM	0.3	4.7	16.1	78.9	-0.5			17.5 ft. to liquid
EW 03	02/04/04	10:29 AM	ND	ND	20.3	79.7	-0.4			23.7 ft. to liquid
EW 04	02/04/04	11:01 AM	0.2	1.7	16.6	81.5	-0.5			13.2 ft. to liquid
EW 05	02/04/04	11:20 AM	0.2	2.5	16.0	81.3	-0.5			23.0 ft. to liquid
EW 06	02/03/04	6:46 PM	ND	0.4	19.9	79.7	-0.6			23.5 ft. to liquid
EW 07	02/03/04	6:33 PM	ND	ND	20.3	79.7	-0.6			minimal vacuum
EW 08	02/04/04	11:49 AM	ND	0.1	19.9	80.0	-0.2			minimal vacuum
EW 09	02/03/04	6:00 PM	ND	0.6	20.0	79.4	-0.6			minimal vacuum
EW 10	02/03/04	5:30 PM	0.2	0.8	20.3	78.7	-0.6			24.2 ft. to liquid
EW 11	02/03/04	5:50 PM	ND	1.0	19.7	79.3	-0.6			24.65 ft. to liquid
EW 12	02/04/04	12:10 PM	ND	0.7	19.3	80.0	-0.2			24.8 ft. to bottom
EW 13	02/03/04	2:53 PM	0.7	1.3	19.6	78.4	-0.4			24.4 ft. to liquid
EW 14	02/03/04	2:40 PM	ND	4.8	11.6	83.6	-0.3			22.4 ft. to bottom
EW 15	02/03/04	2:35 PM	ND	ND	20.4	79.6	-0.5			17.7 ft. to bottom

Location	Date	Time	Methane (% vol.)	Carbon Dioxide (% vol.)	Oxygen (% vol.)	Balance Gas (% vol.)	Pressure (in-W.C.)	Flow (scfm)	Temp. (deg. F)	Comments
EW 16	02/03/04	2:29 PM	ND	ND	20.3	79.7	-0.4			17.2 ft. to bottom;
	03/24/04	12:05 PM	ND	ND	21.2	78.8	-0.1			no liquids
EW 17	02/04/04	12:35 PM	ND	0.1	19.9	80.0	0.0			Casing turns;
	03/24/04	11:50 AM	ND	0.1	21.2	78.7	-6.6			sheared @ 3.3'
EW 18	02/03/04	2:11 PM	ND	4.0	16.7	79.3	-10.8			16.7 ft. to liquid;
	03/24/04	11:37 AM	ND	3.4	16.9	79.7	-8.8			20.6 ft. to bottom
EW 19	02/03/04	*	*	*	*	*	*			under surface water
EW 20	02/03/04	*	*	*	*	*	*			under surface water
EW 21	02/03/04	1:43 PM	ND	1.8	18.9	79.3	0.0			2.8 ft. to liquid
EW 22	02/03/04	*	*	*	*	*	*			23.8 ft. to liquid
EW 23	02/03/04	11:33 AM	3.9	11.7	8.5	75.9	-13.0			23.6 ft. to liquid
EW 24	02/03/04	11:47 AM	ND	3.5	18.2	78.3	-0.9			minimal vacuum;
	03/24/04	10:25 AM	ND	2.1	18.2	79.7	-6.9			16.7 ft. to bottom
EW 25	02/03/04	12:09 PM	ND	ND	20.5	79.5	-1.2			24.2 ft. to liquid;
	03/24/04	10:33 AM	0.8	13.5	6.1	79.6	-11.2			24.8 ft. to bottom
EW 26	02/03/04	12:21 PM	ND	0.6	19.6	79.8	-0.1			minimal vacuum;
	03/24/04	10:46 AM	ND	0.1	20.9	79.0	0.0			16.7 ft. to bottom
EW 27	02/03/04	12:33 PM	ND	3.6	18.1	78.3	0.0			2.8 ft. to liquid;
										15 ft. to bottom
EW 28	02/03/04	*	*	*	*	*	*			surface water;
										8.15 ft. to liquid;
										16.25 ft. to bottom
EW 29	02/03/04	*	*	*	*	*	*			under surface water
EW 30	02/03/04	12:59 PM	ND	0.4	19.7	79.9	0.0			13.5 ft. to liquid
EW 31	02/03/04	1:08 PM	ND	0.1	20.3	79.6	0.6			16.2 ft. to bottom

Location	Date	Time	Methane (% vol.)	Carbon Dioxide (% vol.)	Oxygen (% vol.)	Balance Gas (% vol.)	Pressure (in-W.C.)	Flow (scfm)	Temp. (deg. F)	Comments
S Header 1	02/03/04	10:22 AM	0.7	7.0	13.4	78.9	-20.0		50	EW 1-21 header
N Header 2	02/03/04	10:31 AM	ND	ND	20.7	79.3	-20.1		43	EW 22-31 header
MT 01	02/04/04	9:42 AM	ND	ND	20.6	79.4	-0.6			minimal vacuum
MT 02	02/03/04	7:14 PM	ND	ND	20.3	79.7	-0.7			minimal vacuum
MT 03	*	*	*	*	*	*	*			unable to remove lid
MT 04	02/03/04	7:01 PM	ND	ND	20.3	79.7	-0.6			minimal vacuum
MT 05	02/03/04	6:53 PM	ND	ND	20.2	79.8	-0.6			minimal vacuum
MT 06	02/03/04	6:39 PM	ND	0.3	20.2	79.5	-0.6			minimal vacuum
MT 07	02/03/04	6:22 PM	ND	ND	20.3	79.7	-0.7			23.9 ft. to liquid
MT 08	02/03/04	6:14 PM	ND	0.4	20.1	79.5	-0.7			24.2 ft. to liquid
MT 09	02/03/04	5:55 PM	0.1	0.4	20.0	79.5	-0.6			24.2 ft. to liquid
MT 10	02/03/04	5:24 PM	0.2	ND	20.4	79.4	-0.5			minimal vacuum
		5:37 PM	0.1	ND	20.4	79.5	-0.6			
MT 11	02/03/04	5:15 PM	0.1	0.7	20.4	78.8	-0.5			
MT 12	02/03/04	5:07 PM	0.1	ND	20.5	79.4	3.7			no cap
		5:10 PM	0.1	0.1	20.3	79.5	-0.4			minimal vacuum
MT 13	*	*	*	*	*	*	*			unable to remove lid
MT 14	02/03/04	2:48 PM	ND	0.8	17.8	81.4	-0.3			broken cap w/plug
MT 15	03/24/04	12:20 PM	ND	ND	21.0	79.0	0.0			Casing turns

Location	Date	Time	Methane (% vol.)	Carbon Dioxide (% vol.)	Oxygen (% vol.)	Balance Gas (% vol.)	Pressure (in-W.C.)	Flow (scfm)	Temp. (deg. F)	Comments
MT 16	02/03/04	2:23 PM	ND	0.3	19.4	80.3	0.0			minimal vacuum
	03/24/04	12:00 n	ND	ND	21.0	79.0	-15.4			
MT 17	02/03/04	2:16 PM	ND	0.3	20.1	79.6	-19.8			
	03/24/04	11:45 AM	ND	0.4	20.9	78.7	-16.6			3.7 ft. to liquid
MT 18	02/03/04	2:07 PM	ND	4.7	16.2	79.1	-20.1			
	03/24/04	11:31 AM	ND	1.0	19.9	79.1	-16.6			
MT 19	02/03/04	2:01 PM	ND	4.4	16.5	79.1	-20.5			
MT 20	02/03/04	1:53 PM	0.1	4.4	16.8	78.7	-22.0			
MT 21	02/03/04	1:37 PM	0.1	0.1	20.5	79.3	-20.7			
MT 22	*	*	*	*	*	*	*			unable to open cap
MT 23	02/03/04	11:42 AM	ND	0.1	20.6	79.3	-19.6			
	03/24/04	10:12 AM	0.8	11.7	7.7	79.8	-16.8			
MT 24	02/03/04	11:59 AM	ND	0.3	20.3	79.4	-1.2			minimal vacuum
MT 25	02/03/04	12:16 PM	0.8	7.7	11.0	80.5	-1.2			minimal vacuum
	03/24/04	10:38 AM	ND	0.7	20.7	78.6	-16.0			
MT 26	02/03/04	12:26 PM	ND	1.3	19.1	79.6	-0.1			minimal vacuum
	03/24/04	10:51 AM	ND	1.2	18.9	79.9	0.0			no vacuum
MT 27	02/03/04	12:39 PM	ND	0.4	19.6	80.0	-0.2			minimal vacuum
MT 28	*	*	*	*	*	*	*			under surface water
MT 29	02/03/04	12:53 PM	ND	0.6	19.7	79.7	-2.6			minimal vacuum
MT 30	02/03/04	1:04 PM	ND	2.6	16.9	80.5	0.1			no vacuum

Location	Date	Time	Methane (% vol.)	Carbon Dioxide (% vol.)	Oxygen (% vol.)	Balance Gas (% vol.)	Pressure (in-W.C.)	Flow (scfm)	Temp. (deg. F)	Comments
Probe G1A	03/26/04	4:51 PM	6.1	8.8	ND	85.1	0.2			
Probe G1B	03/26/04	4:53 PM	7.5	8.6	ND	83.9	0.2			
Probe G1C	03/26/04	4:57 PM	5.3	6.6	5.0	83.1	0.2			
Probe G1D	03/26/04	5:00 PM	7.5	9.0	ND	83.5	0.2			
Probe G2A	03/26/04	4:29 PM	ND	2.7	14.1	83.2	0.1			
Probe G2B	03/26/04	4:33 PM	ND	7.0	8.3	84.7	0.1			
Probe G2C	03/26/04	4:35 PM	ND	0.3	18.8	80.9	0.0			
Probe G2D	03/26/04	4:38 PM	ND	1.3	17.1	81.6	0.0			
Probe G3A	03/26/04	4:08 PM	ND	ND	20.4	79.6	-0.1			
Probe G3B	03/26/04	4:11 PM	ND	2.3	16.9	80.8	-0.1			
Probe G3C	03/26/04	4:14 PM	ND	4.6	14.9	80.5	-0.2			
Probe G3D	03/26/04	4:17 PM	ND	ND	20.4	79.6	-0.2			
Probe G4A	03/26/04	3:45 PM	ND	7.5	6.4	86.1	0.1			
Probe G4B	03/26/04	3:49 PM	ND	10.9	2.3	86.8	0.0			
Probe G4C	03/26/04	3:54 PM	ND	ND	20.4	79.6	0.1			
Probe G4D	03/26/04	3:57 PM	ND	0.2	19.7	80.1	0.1			
Probe G5	03/26/04	5:21 PM	ND	ND	20.1	79.9	0.0			
		5:23 PM	ND	ND	20.3	79.7	0.0			

% vol.      Percent by volume  
in-W.C.      Inches of water column  
ND          None Detected  
scfm        Standard cubic feet per minute  
deg F       Degrees in Fahrenheit

EW      Extraction well  
MT      Moisture trap  
S        South  
N        North